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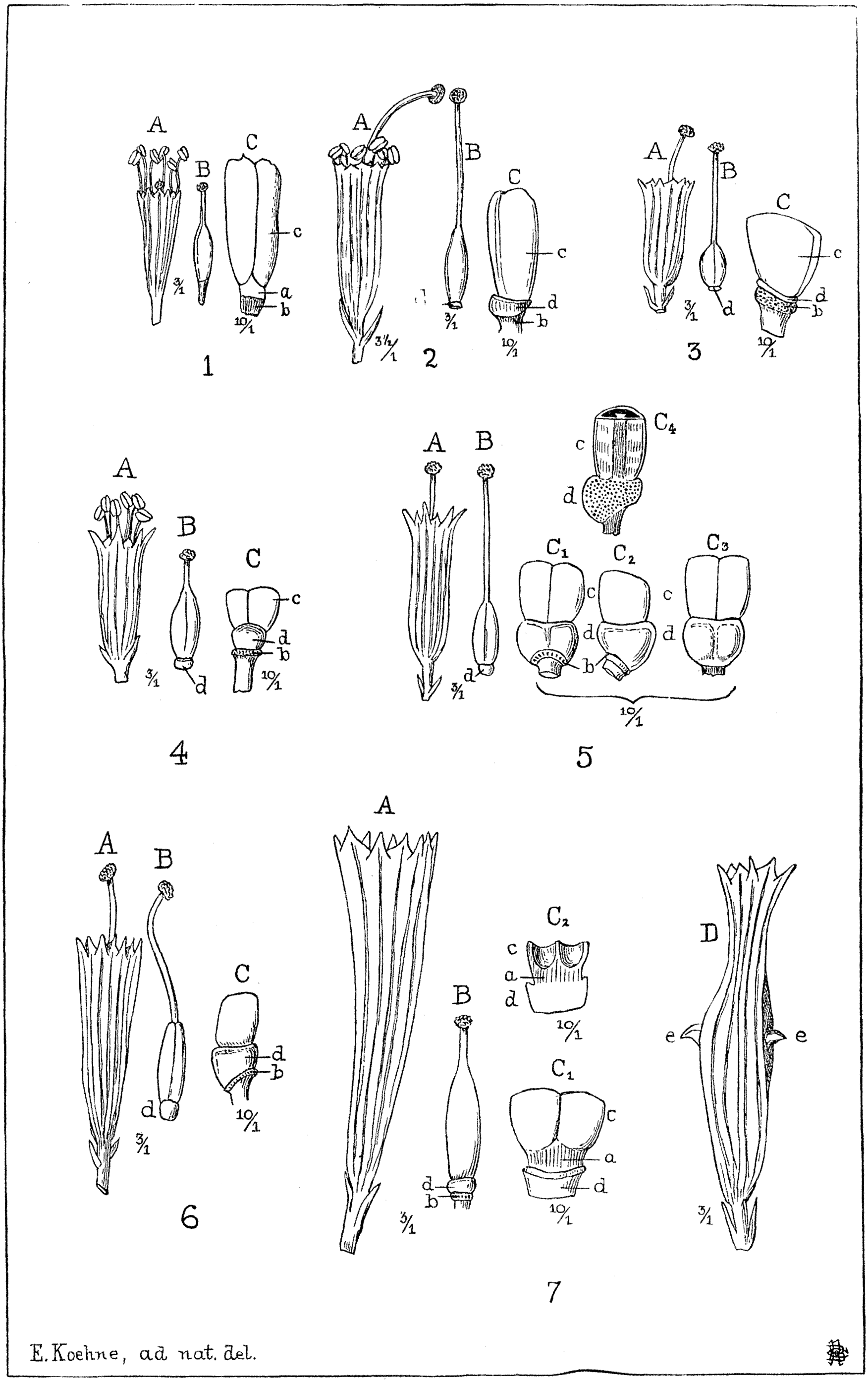

E. Koehne, ad nat. del.

KOEHNE ON LYTHRACEÆ.

BOTANICAL GAZETTE.

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The Lythraceæ of the United States.

BY E. KOEHNE (Berlin-Friedenau).

Since I have been occupied during fourteen years with an investigation as careful as possible of the *Lythraceæ*, I think it will be of some interest to North American botanists to learn the results of my studies, as far as they concern species of the United States. The systematic part of my monograph has been published in the first four volumes of *Engler's Botanische Jahrbucher*. In the fifth and sixth volumes, in two extensive articles, I have treated of the morphology of the order, and in one of the following volumes I will speak with some completeness of its geographical distribution. The whole will be concluded by a complete index of names, including the synonyms.

It is not my intention to give, in the following notes, descriptions or diagnoses of the North American *Lythraceæ*, but only names, synonyms, and geographical range, accompanied by a few remarks. I hope the botanists of the United States will be compelled by these remarks to pay more attention to certain critical and interesting forms than they have as yet done. I will take pleasure in determining any Lythraceous plants which botanists will send me.

As for the descriptions, I must refer to my monograph, but it will be of use to supply this defect at least by short analytical keys.

KEY TO THE GENERA.

- Flowers unsymmetrical, with 6 petals and 11 stamens. V. CUPHEA.
- Flowers regular.
  - Flowers solitary in the axils of the leaves, sessile or subsessile.
    - Calyx shortly campanulate or semiglobose. Stamens 4.
      - Capsule indehiscent. Petals none. III. PEPLIS.

Capsule dehiscent, with 3 or 4 elegant septicide valves. Petals 4.	I. Rotala.
Calyx tubulose. Petals 6. Stamens 12.	IV. Lythrum.
Flowers solitary, but on very long (12-28mm.) pedicels. Petals generally 6. Stamens 12 or 13.	VI. Nesæa.
Flowers in three- or many-flowered cymes, that rarely are reduced to a single axillary flower.	
Capsule bursting irregularly. Petals generally 4, or none. Flowers not trimorphous.	II. Ammannia.
Capsule 3-valved, or rarely 4-valved, loculicide. Petals 5, rarely 4. Stamens 10, rarely 8. Flowers trimorphous.	VII. Decodon.

I. Rotala L. sens. ampl.

Petals 4: accessory teeth of the calyx as long as the lobes or shorter.	1. *R. ramosior*,
Petals 0: accessory teeth of the calyx thrice as long as the lobes, subulate.	*R. dentifera.*

1. **R. ramosior** Koehne, no. 3 of Monograph, l. c. vol. i. p. 157. (*Ammannia ramosior* L. Sp. Pl. 1753, nec L. Mant., nec Pursh: *A. humilis Michx.* 1803: *Boykinia humilis* Raf. 1817: *Peplis occidentalis* Spreng. 1825: *Ammannia catholica* Cham. et Schl. 1827: *A. occidentalis* DC. 1828; Chapm. 1865, pro parte: *A. monoflora* Blanco, 1837: *Isnardia ascendens* Hall ed. Eat. sec. A. Gray.) From Boston and Florida to St. Louis and Texas; also in California and Oregon from the Yosemite Valley to the Columbia River; then from Mexico and the West Indies to Brazil and Ecuador, and on the Philippine Islands. It will be rather difficult, I fear, to convince North American botanists of the necessity of separating the genus *Rotala* from *Ammannia*, for, unfortunately, the only species met with in the United States has an Ammannia-like habit, which is not to be observed in the 31 other species of *Rotala*. The African *R serpiculoides* only bears a character of the genus *Ammannia*, having its flowers disposed in axillary sessile cymes. Although I have to differ from such high authority as Bentham and Hooker, who brought *Rotala* under *Ammannia*, I can not but insist on the diversity of the two genera, for the latter differs from *Rotala* no less than from *Lythrum*. Whoever may have occasion to examine a great number of species of *Rotala* will be struck by the peculiarities, by which this genus proves to have pursued a course of evolution very divergent from that of *Ammannia*. The principal distinctive characters of the two are the following: the capsule of *Ammannia* bursts irregularly, that of *Rotala* separates into 3 or 4 septicide valves. Also, a bit of the capsule wall of *Rotala* mounted in water, and examined with a magnifying power of twenty diame-

ters or more, will be seen to be transversely and densely striated in a very elegant manner. Nothing of a similar kind is to be observed in any other genus of the whole order *Lythraceæ.* This microscopical character is sufficient for recognizing any Lythraceous plant as a *Rotala.* Besides, every species of *Ammannia* presents axillary cymes, while *Rotala* has solitary flowers in the axils of leaves or bracts, except the above mentioned African species. For more details see my Monograph, l. c. vol. i. pp. 146–148; vol. v. pp. 114, 117, 127; vol. vi. pp. 8, 24–26, 34, 35. I have been compelled by my studies to unite with *Rotala* two genera separated from *Ammannia* by Bentham and Hooker, viz., the Abyssinian *Rhyacophila* Hochst. and the East Indian *Hydrolythrum* Hook. fil. *Rotala ramosior* bears all the characters of the genus, and it is only its habit that has misled botanists into bringing it under *Ammannia* and, in general, to unite the whole genus with the latter.

R. DENTIFERA Koehne, no. 12 of Monograph, l. c. vol. 1. p. 161. (*Ammannia dentifera* A. Gray, 1853.) I have not seen this species, which has been found only near Santa Cruz, in the Mexican State of Sonora, but will probably be met with in the adjoining parts of the United States.

It may be added that the small *R. Mexicana* Cham. et Schl., a species widely spread from Mexico to the West Indies and Brazil, from Japan to Australia, and from the East Indies to Madagascar and West Africa, may possibly occur also in Southern Texas or in Florida.

II. AMMANNIA L. sens. restr.

Petals 4: stamens exserted.	
Capsule half exserted: peduncle 2mm. long: cymes rather loose: stamens 4, rarely 3.	2. *A. auriculata.*
Capsule totally included: cymes subsessile, dense: stamens 4-8.	3. *A. coccinea.*
Petals 0: stamens 4, included: stigma subsessile.	4. *A. latifolia.*

2. A. AURICULATA Willd. 1806 (?): no. 32 of Koehn. Mon. l. c. vol. i. p. 244. (*A. arenaria* HBK. 1823: *A. Senegalensis* DC. 1828; St. Hil. pro parte, nec Lam.: *A undulata* C. A. Meyer, 1842: *A. pusilla* Sonder. 1848: ?A. *sagittata* var. *angustifolia* A. Rich. 1845: *A. Wrightii* A. Gray, 1853: ?*A. longipes* Sauvalle, 1868.) I have seen no North American specimens except from New Orleans. The species extends from the Rio Grande del Norte to Ecuador and Brazil, from the Cape to Senegambia and Abyssinia, and along the Nile to its mouth, from the Caspian Sea through Eastern India to Southern China and Australia. It has sometimes been confounded with *A coccinea.*

3. A COCCINEA Rottbœll. 1773: no. 35 of Koehn. Mon. l. c. vol. 1. p. 249. (*A. latifolia* L. 1753, pro parte?: *A. ramosior* L. Mant. 1771, nec L. Sp. Pl.: *A. purpurea* Lam. 1783: *A. sanguinolenta* Swartz. 1797: *A. octandra* var. β Poiret, 1810: *A. stylosa* Fisch. et Mey. 1841: ?*A. sagittata* var. *angustifolia* A. Rich. 1845: *A. Texana* Scheele, 1846: *A. humilis* Chapm. 1865, pro parte: ?*A. longipes* Sauvalle, 1868.) From New Jersey to St. Louis and New Orleans, then from Mexico to Brazil, and on the Sandwich, Marian, and Philippine Islands. I do not understand how this species could be united or confounded with *Rotala ramosior*, as has been done by Chapman, and long ago by Linnæus.

In my monograph I cited *A. Texana* Scheele as a synonym for *A. coccinea*, but I added a sign of interrogation. This sign was superfluous, as I have seen in a specimen collected by Dr. O. Kuntze, near St. Louis, in 1874. This specimen seemed to agree entirely with the diagnosis given by Scheele, running as follows: "Petala 4, stamina exserta, stylus capsula sextiplo brevior," etc. I was convinced for some time that the specimen was indeed *A. Texana* Scheele, for the stamens were exserted, but the *capsule* had a very short style ending in a distinct stigma, and I saw no flower with an elongated style. Then treating some younger flowers with hot water for the purpose of making drawings of the supposed *A. Texana*, I at once detected elongated styles on the *ovaries*, and settled the true nature of the presumed stigmas of the *capsules*. The styles break off before the capsules are ripe, and only their base persists on the top of the capsule. The upper end of this persistent base is somewhat thickened and presents the very aspect of a stigma. This observation induces the conviction that Scheele was deceived by the apparently short styles of the capsules (for he mentions the capsules only, not the ovaries) as I was at first. It must consequently be stated that there is no *Ammannia* with exserted stamens and short style, and that *A. Texana* is a synonym of *A. coccinea* Rottbœll.

4. A. LATIFOLIA L. Sp. Pl. 1753 (an pro parte?): no. 37 of Koehn. Mon. l. c. vol. i. p. 251. (*Isnardia subhastata* Ruiz et Pav. 1798: *Jussiœa sagittata* Poir. 1818: *Ammannia ramosior* Ell. 1821, pro parte: *A. pallida* Lehm. 1823: *A. hastata* et *A.? sagittata* DC. 1828: *A humilis* var. β Torr. et Gray, 1838–40: *A. lingulata* Griseb. 1866: *Ludwigia scabriuscula* Kellogg, sec. Watson.) Mobile, New Orleans, Northern Mexico to the West Indies, to Peru (Lima), and Paraguay.

III. Peplis L.

5. *P. diandra* Nutt. ed. DC. 1828: no. 49 of Koehn. Mon. l. c. vol. i. p. 263. (*Callitriche autumnalis*? Michx. 1803, sec. Watson: *Didiplis linearis* Raf. 1833: *Hypobrichia Nuttallii* M. O. Curt. ed Torr. et Gray, 1838–40: *Ptilina aquatica* Nutt. Ms. sec. Endl.: *Didiplis diandra* Wood, 1855, sec. Watson: *Ammannia Nuttallii* Gray, Man. ed. 4.) From North Carolina and Florida through Illinois to Minnesota, St. Louis, and Texas. I can not detect differences of any weight between *Didiplis* and the true European *Peplis*. It is of little consequence that the flowers of the former are tetramerous, and those of the latter hexamerous, this character being variable in more than one genus of *Lythraceæ*. On the other hand, I can not agree with M. Baillon, who brings *Peplis* under *Ammannia*, for the European species of *Peplis* are much nearer allied to *Lythrum*, by means of *L. nummulariifolium* Loisleur, than to *Ammannia*. As to the number of stamens of *Peplis diandra*, it is often said to be two, but the numerous flowers I examined were all tetrandrous.

IV. Lythrum L. sens. restr.

Flowers solitary in the axils, rarely binate by an accessory flower.
  Flowers not dimorphous: petals rather small: stamens ordinarily 4 to 6, included. 6. *L. Hyssopifolia.*
  Flowers dimorphous: petals rather large: stamens 6, the dorsal ones inserted lower than the ventral ones.
    Ovary on a thick short stalk; no fleshy hypogynous ring: leaves linear, almost always opposite. 7. *L. lineare.*
    A fleshy hypogynous ring, often very small.
      Calyx (with the accessory teeth) 1½ to 6½mm. long: stamens of the short-styled flowers exserted: leaves alternate, or the lower ones opposite.
        The fleshy hypogynous ring small, or very small.
          Leaves linear, or the cauline ones linear-lanceolate. 8. *L. album.*
          Leaves suborbicular or oblong. 9. *L. ovalifolium.*
        The height of the fleshy ring equalling its diameter.
          Leaves oblong-linear or lanceolate, with an acute or cuneate base. 10. *L. lanceolatum.*
          Leaves oblong or linear-lanceolate, with a cordate or rounded base. 11. *L. alatum.*
      Calyx (with the accessory teeth) 8 to 14mm. long: the height of the fleshy ring equalling its diameter.
          Leaves linear, alternate: stamens of the short-styled flowers exserted. 12. *L. Californicum.*

Leaves oblong or ovate, with a cordate or rounded base, generally opposite: stamens of the short-styled flowers included or scarcely exserted. 13. *L. Vulneraria.*
Cymes of flowers arranged in terminal spikes: flowers trimorphous. 14. *L. Salicaria.*

6. L. HYSSOPIFOLIA L. 1753: no. 59 of Koehn. Mon. l. c. vol. i. p. 315. (The synonyms of this species may be passed by. It has often been confounded with *L. Thymifolia* L.) From Maine to Massachusetts near the coast, also in California near Calistoga and near the bay of West Berkeley, in Columbia near Quindiú, in the Argentine Republic, Uruguay and Rio Grande du Sud, in Chili and on the island of Juan Fernandez, in Europe from Spain and Ireland to Sarepta, thence in Siberia to the Altai region, on the Azores, Madeira, and the Canary Islands, in Northern Africa, in Abyssinia, at the Cape, in Eastern Australia and New Zealand.

7. L. LINEARE L. 1753: no. 64 of Koehn. Mon. l. c. vol. i. p. 320. (*Pythagorea linearis* Raf. 1819: *L. virgultosum* Griseb. 1866, excl. synom.)

8. L. ALBUM HBK. 1823: no. 65 of Koehn. Mon. l. c. vol. i. p. 320. (*L. albicaule* Bertero, 1829 and 1830: perhaps *L. alatum* var. δ Torr. et Gray, 1838–40: *L. Californicum* Torr. et Gray, nec Watson: *L. Græfferi* Gay, 1846, nec Tenore: *L. alatum* vars. *lanceolatum* et *linearifolium* A. Gray, 1846.) California, New Mexico, Texas, Mexico, Chili. This species differs undoubtedly from *L. alatum*, the latter being well characterized by its large hypogynous ring and the form of its leaves. This ring of the dimorphous *Lythra* has been overlooked before by all botanists. I have dissected numerous flowers for the purpose of ascertaining the diagnostic value of the ring, and I have found that it is absolutely constant in form and size.

9. L. OVALIFOLIUM Engelm. ed. Koehn.: no. 66 of Koehn. Mon. l. c. vol. i. p. 323. (*L. alatum* var. *ovalifolium* et var. *pumilum* A. Gray, 1846: ? *L. flagellare* Shuttleworth, sec. A. Gray et Watson.) Western Texas (and Florida?) This species differs from *L. alatum* chiefly in its very small hypogynous ring; from *L. album* in its habit and broader leaves. The ring of the latter is also twice as thick as in *L. ovalifolium.*

10. L. LANCEOLATUM Elliott, 1821: no. 69 of Koehn. Mon. l. c. vol. i. p. 323. (*L. virgatum* Walter, 1788, nec. L.: *L. satureifolium* fl. Mex. ined. sec. DC.: *L. Hyssopifolia* var. *virgultosum* DC. 1828: *L. alatum* var. *lanceolatum* Torr. et Gray, 1838–40: *L. Hyssopifolia* A. Rich. 1845; nec L.: *L. alatum* Hook.

1840, pro parte: *L. hyssopifolium* Curt. 1841: *L. alatum* var. *breviflorum* A. Gray, 1846: *L. breviflorum* Watson: ? *L. flagellare* Shuttlew.) From Carolina and Florida to Arkansas and Texas (also in New Scotland?), Mexico, Cuba, San Domingo. A very good species that may always be distinguished with certainty from *L. alatum.*

11. L. ALATUM Pursh, 1814: no. 70 of Koehn. Mon. l. c. vol. i. p. 324. (*Pythagorea alata* Rafin. 1819.) From Canada, Wisconsin, and Colorado (Denver), to Arkansas and Georgia. This species is by no means so variable as has been supposed. I could always distinguish it without any difficulty from all the other species enumerated in these notes.

12. L. CALIFORNICUM Watson, 1878; nec Torr. et Gray: no. 71 of Koehn. Mon. l. c. vol. i. p. 324. California, Napa Valley. It differs from the last in its linear leaves and larger flowers.

13. L. VULNERARIA Ait. ed. Schrank, 1819: no. 72 of Koehn. Mon. l. c. vol. i. p. 325. (*L. alatum* Sims, 1816; DC. 1828, pro parte; nec Pursh: *L. Kennedyanum* HBK. 1823: *L. alatum* var. Torr. et Gray, 1838–40, pro parte.) Philadelphia (cultivated?), St. Louis, Mexico. I do not understand how it is possible to mistake this excellent species for *L. alatum.* See its characters above in the analytical key.

14. L. SALICARIA L. 1753: no. 73 of Koehn. Mon. l. c. vol. i. p. 326. (The numerous synonyms of this species may be passed by.) From Canada and New Scotland to Delaware; in Europe, except the most northern parts; in Asia from a line drawn from Tobolsk to Sachalin and Japan southward to China, Thibet, Cashmir, and Persia; in Northern Africa (but not in Egypt); also in Eastern Australia.

V. CUPHEA P. Browne sens. ampl.

Dorsal lobe of calyx not longer than the ventral ones: calyx 6 to 9mm. long.
  Pedicels 1 to 2mm., rarely 4mm. long: leaves opposite: ovules 8 to 20, generally 14 or 15. 15. *C. glutinosa.*
  Pedicels 5 to 15mm. long: leaves verticillate: ovules 3. 16. *C. aspera.*
Dorsal lobe of the calyx much longer than the ventral ones: calyx 8 to 13mm. long: leaves opposite: ovules 7 to 13. generally 9 or 10. 17. *C. petiolata.*

15. C. GLUTINOSA Cham. et Schl. 1827: no. 120 of Koehn. Mon. l. c. vol. ii. p. 148. (*C. hirsuta* Gillies ed. Hooker, 1833: *C. ingrata* var. *Platensis* St. Hil. 1833: *C. hyssopifolia* Griseb. 1874, pro parte, chiefly the var. *brachyphylla.*) From the interior of Bolivia to the Sierras Pampeanas in Patagonia, and to

Rio Grande du Sud, and Uruguay. I was greatly surprised to see specimens collected in 1884 by Mr. Langlois near Vermillionville in Western Louisiana, kindly sent me by Mr. Watson. They are quite identical with the ordinary South American forms, from which they differ only in the want of the small margin of the seeds; but this margin, that formerly seemed to me to be a section character, is often absent also in some species nearly allied to *C. glutinosa.*

16. C. ASPERA Chapm. 1865: no. 149 of Koehn. Mon. l. c. vol. ii. p. 161 and vol. iv. p. 400. St. Joseph, Florida. This species represents, geographically, a pendant to the preceding, for it belongs to the South American group *Oidemation*, which inhabits the extra-tropical parts of Brazil, Paraguay, and the northern parts of the Argentine Republic. It is very like the Brazilian *C. hyssopoides* St. Hil.

17. C. PETIOLATA Koehne: no. 178 of Koehn. Mon. l. c. vol. ii. p. 173. (*Lythrum petiolatum* L. 1753: *C. viscosissima* Jacq. 1772: *Lythr. Cuphea* L. fil. 1781, pro parte: *Silene axillaris* Leavenw. sec. Torr et Gray.) From Connecticut and Pennsylvania to Georgia, and from Missouri to Louisiana. Since Linnæus' son confounded this species with the subsequently distinguished *C. Balsamona* Cham. et Schlecht., and consequently said it was to be met with also in Brazil, all subsequent authors have made erroneous statements as to its geographical distribution. It inhabits only the United States from the region of the Mississippi eastward, and belongs to the very marked group *Heterodon*, which is exclusively Mexican or Central American.

It is not impossible that *C. Wrightii* A. Gray, a species nearly allied to the preceding and inhabiting Mexico northward to the Rio Grande, may be discovered in South-western Texas or in New Mexico.

VI. NESÆA Commers ed. HBK.

18. N. LONGIPES A. Gray, 1852: no. 306 of Koehn. Mon. l. c. vol. iii. p. 335. Western Texas and North-eastern Mexico. A very near ally of the West African *N. linifolia* Welw. ed. Hiern, and of the Australian *N. Robertsii* F. v. Muell., both of which are very similar to it. The genus *Nesœa* is probably the oldest of the whole order. It is nearly allied to *Ammannia*, from which it differs chiefly in the complete septa of the ovary, the septa of *Ammannia* being incomplete above the placenta.

Heimia salicifolia Link, that reaches the north of Mexico, may hereafter be discovered in New Mexico or Texas. *Heimia* is to be separated from *Nesœa*, although closely related, by the dehiscence of its capsule. The capsule of the former dehisces septicidally, while that of the latter opens by a little operculum and then slits septifragally but in a rather irregular way.

VII. DECODON Gmel.

19. D. VERTICILLATUS Ell. 1821: no. 315 of Koehn. Mon. l. c. vol. iii. p. 342. (*Lythrum verticillatum* L. 1753: *Anonymos aquatica* Walter, 1788: *Decodon aquaticus* Gmelin. 1791: *Nesœa verticillata* HBK. 1823.) From Canada and Wisconsin to Florida and Louisiana. *Decodon* could possibly be united with *Heimia* (but not with *Nesœa*), the capsule dehiscing in the same manner. Yet not only the different color of the petals and the different disposition of the flowers, but also the near relationship of *Decodon* and *Grislea* and *Adenaria* have decided me in keeping them separate. The relationship between *Decodon* and *Grislea secunda* Lœfl. is even greater than that between the former and *Heimia.*

EXPLANATION OF PLATE VI.—In all the figures *a* is the ovary stalk; *b*, the insertion of the calyx; *c*, the base of the ovary; *d*, the hypogynous fleshy ring; *e*, capsule valves; A, the calyx; B, the ovary; C, the lower part of the ovary.

Fig. 1. *L. lineare*, short-styled: Fig. 2. *L. album*, long-styled: Fig. 3. *L. ovalifolium*, long-styled: Fig. 4. *L. lanceolatum*, short-styled: Fig. 5. *L. alatum*, long-styled (C_1 the ventral, C_2 the lateral, C_3 the dorsal view, C_4 the longitudinal section): Fig. 6. *L. Californicum*, long-styled: Fig. 7. *L. Vulneraria*, short-styled (C_2 the longitudinal section, the calyx with dehiscing fruit).

Notes upon the Botany of the New Orleans Exposition.

BY CHARLES E. BESSEY.

The great Exposition at New Orleans has brought together a mass of material illustrating on a scale never before equalled the natural products, both vegetable and animal, of the United States and the countries adjoining. In all this there is much to interest and instruct the student of plants, and it will well repay our younger botanists to give this portion of the Exposition a week or two of observation. It is impossible, and indeed it is not advisable, to discuss fully the botany of the Exposition, but a few running notes may be of use to those who intend to visit New Orleans, at the same time serving as a summary record of the botanical results of this labor of the people.

In the government building many of the States have exhibits of botanical specimens, evidently extracted from the herbaria of